Mecheleciv

Volume 23 November - 1964 No. 2

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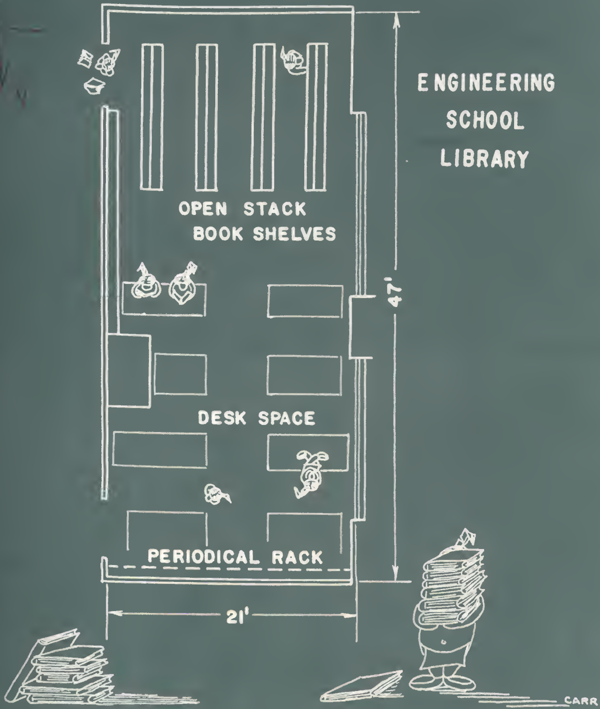

THE GEORGE WASHINGTON UNIVERSITY

NOVEMBER 1964

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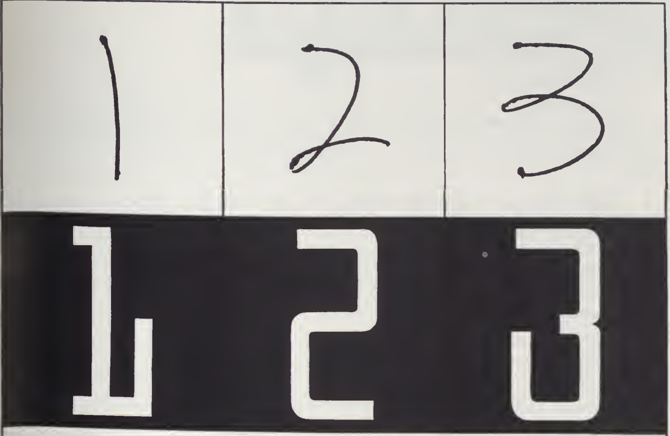

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EDITORIAL

A Shortage of Engineers?

A recent report of the Engineering Manpower Commission indicates that, in the last two years, demand for engineers has been easing off. The Engineer/Scientist Demand Index of Deutsch & Shea, an advertising and consulting firm specializing in technical manpower recruitment, reveals the same trend. Their index (1961 = 100.0) has dropped from 119.8 in 1962 to 92.7 in 1963.

To many of us, as engineering students, this comes as a great surprise. How many times have we been told of our Nation's ever-increasing demand for more engineers? From the President's Science Advisory Committee, we have been warned "of the fast approaching crisis in engineering shortages." From the Bureau of Labor Statistics, a survey, based on an extrapolation of data from the period 1954 to 1959, has predicted a demand for new engineers of about 82,000 per year until 1970. Presently, the United States graduates only about 40,000 per year. With only half as many engineers graduating each year as are needed, the demand ought to be increasing, not decreasing.

Why then is there an apparent decrease in demand for men with engineering training? Before blaming the recent cut-back in defense contracts or some other factor of our economy, it would be well to examine the problem in more detail. The above mentioned report of the Engineering Manpower Commission, based on information obtained from some 543 companies and government agencies employing more than a quarter of a million engineers, indicates that the problem is not so serious for new graduates as it is for experienced engineers. The hiring of experienced engineers dropped 11% in 1963 and recruiting goals for 1964 have decreased another 11%, but for new engineering graduates, hiring has dropped only 6% and recruiting goals for 1964 have decreased just 1%. "Judging by the results of the report," concluded William M. Holt, Chairman of the Commission, "employers will maintain active recruiting programs for new engineering graduates, especially those with some advanced training. When hiring experienced engineers, employers will probably concentrate on obtaining only high-quality men with training in the field specifically related to particular openings."

So the demand for new engineers, although not as great as we would like it, is still such that we have little need to worry about not finding a job after graduation. What we do need to worry about is keeping our jobs. For what the Engineering Manpower Commission's data would lead us to believe is that apparently only recent engineering graduates have enough up-to-date technical knowledge to solve the kind of problems facing industry and government today. The real danger, then, after graduation is going to be from "technical obsolescence." The present rate of growth of scientific and engineering knowledge can antiquate in just a few short years much of what the engineer learns in school.

Engineering is a dynamic profession. Engineers are needed most in changing, growing industries. Often today, a scientific breakthrough will create a need for engineers prepared to explore and develop the full economic potential of the new knowledge. Only engineers having a firm foundation in the basic principles of applied science and mathematics will have the necessary versatility for the job. So we can be assured that there is, and will always be, a demand for high-quality, flexible engineering graduates of the kind educated here at George Washington's School of Engineering and Applied Science. For our faculty has indeed recognized the problem of "technical obsolescence" which we must face after graduation and has long been stressing the importance of fundamental, mathematically based, knowledge applicable to engineering fields not even heard of today.

the Mecheleciv

VOLUME 23 NOVEMBER - 1964 No. 2

ARTICLES page

DEPARTMENTS

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Ice Cap Engineering

by Paul E. Rova

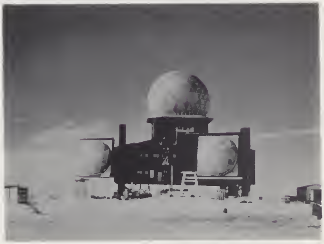
In recent years the U.S. Air Force has been engaged in a number of programs requiring extensive construction in remote areas of the Arctic. The Distant Early Warning Line, (DEW Line) for detection of aircraft, the Ballistic Missile Early Warning System, (BMEWS) for detection of ballistic missiles, and communications networks linking Arctic sites with the United States are examples of such programs. The highly specialized requirements of these electronic systems combined with unusual climatic and geologic conditions found in the Arctic have generated unique and interesting problems in the civil engineering field.

The Eastern extension of the DEW Line, which was recently completed, offers a particularly interesting example of such a problem. This extension of the DEW Line consists of four radar detection stations positioned on an East-West line across Greenland. Two of the stations are situated on the Greenland Ice Cap. The name, Ice Cap, is misleading because most of the surface is actually snow which becomes denser with depth until at very great depths the weight of the mass above compresses the snow into a form of ice. The depth at which this occurs is too great, however, to be of any interest from a construction foundation standpoint.

Another phenomenon which must be considered in ice cap construction is the steady subsidence of any object placed on the surface. One theory explaining this is that each year approximately two to three feet of snow accumulates. Accumulations from previous years are compacted by each succeeding year's snowfall. An object placed on the surface is carried downward by this compaction process. To account for the fact that the elevation of the ice cap remains relatively stable over the years, the theory postulates that at great depths the pressures from above cause a lateral movement toward the sea which terminates in the numerous glaciers found along the Greenland coasts from which icebergs are continually calving.

The Air Force had gained some measure of experience in ice cap living thanks to an earlier experience with two small aircraft control and warning stations built on the ice cap near Thule. These stations were built inside huge, corrugated steel cylinders buried in the snow. Besides the harsh natural environment, the windowless buildings, buried beneath the snow, proved to be man-made obstacles to maintaining an effective level of morale. Differential settlement and consequent warping of the steel cylinders created a serious problem with radar operation. To avoid these same mistakes on the DEW Line extension, the Air Force studied a number of structural schemes which were considered feasible for ice cap construction.

The design selected was a composite structure suspended 19 feet above the surface of the snow on sixteen columns arranged in pairs. The area under the structure was first excavated to a depth of 35 feet. The snow under each column footing was compacted in lifts to form a four foot layer. The column footing is a grillage of standard structural shapes. A mat of 6 x 12 planks separates the steel from the snow. This mat serves two purposes. It acts as a thermal barrier to reduce heat transfer from the columns to the snow, and secondly, it distributes the load over a greater area of snow. This footing arrangement is estimated to give a 4000 psf allowable bearing pressure. Each pair of columns is equipped with hydraulic jacks which allow the building to be leveled should any differential settling occur and also, permit the entire building to be raised to maintain the 19 foot clearance above the snow.



Because of the previous difficulty in maintaining morale at the old ice cap stations, the Air Force departed from the usual austere standards for personnel facilities in the case of these stations. A small gymnasium, a steam room, a comfortable lounge and individual bedrooms have been incorporated for the 20 man operating crew.

However novel these structures may seem in appearance, with communication antenna shelters cantilevered from the sides, columns jutting through the roof, and a 68 foot diameter radome surmounting the building, few structures have received such careful study and treatment in the design for environmental conditions as these stations.

Paul E. Rova, when he originally wrote this paper as a Sigma Tau pledge, had just finished an assignment as Project Officer in the Construction Division, USAF, for the above and many other Air Force Construction projects in the Arctic.

DOES IT PAY

by Richard C. Szymanski

In this paper, the advantages and disadvantages of filing for and prosecuting patents will be reviewed. The benefits of patenting will be compared to those of "trade secrets," and those areas in which trade secrets are more advantageous will be discussed.

Ground Rules of Patent Law. Before the discussion of the merits of patents in guarding the rights of inventors to manufacture, use, and sell their inventions can commence, a brief summary of the fundamentals of patent law is considered helpful and is presented here:

Patents are negative in that they are not rights to make products but rather rights to keep others from making them.

The fact that an inventor possesses a patent does not automatically protect him if opposing parties ignore the patent. If the patent holder should desire redress against the invasion of his property, he must resort to the courts.

An idea, in order to be patentable, must satisfy three statutory requirements:

1. The idea must fall within at least one of the statutory classes of patentable subject matter. These classes are as follows:

    a. Art (Process) -- a connection of steps or operations for accomplishing a physical result.

    b. Machines -- a mechanical device or combination of devices to perform some function and produce a certain effect or result.

    c. Composition of Matter -- results from the intermixture of two or more specific ingredients which possess properties different from those possessed by the several ingredients individually.

    d. Manufacture -- An article of manufacture or product (distinguished from a machine).

    e. Plant -- a new variety of plant asexually reproduced.

    f. Designs -- the appearance or aesthetic value of an article.

2. The ideas must have utility and possess dignity of invention as distinguished from mere mechanical skill.

3. The idea must not lack statutory newness or novelty.

An application for a patent must be filed within one year of the first publication, public use or date of foreign filing.

Some Advantages and Disadvantages of Patenting

Patents serve as competitive weapons in that they grant the holder a limited monopoly on its valid claims. But there are a large number of patents which are of little if any value in that they are not able to keep others from manufacturing, selling and using the invention in a slightly modified form. Patent claims and specifications are difficult to write in that it is almost an impossible job to cover all the ways in which a task may be accomplished.

Being the first to file for a patent has the advantage of establishing priority in interference cases. In a recent year, the senior filing party of interference cases were adjudged the inventor in a ratio of four to one. The burden of proof of prior invention is placed on the junior parties and their trial expenses on the average are much higher. A filing in time might save nine (thousand dollars).

Possessing a valuable and valid patent enables one to collect royalties on its licensing and provides a direct and accountable return on research and patent activities. Licensing also enables one to set up second product sources, satisfies anti-trust laws and helps to meet a demand which does not justify the expansion of its facilities.

An improvement patent held against a basic patent may serve the inventor as a foothold in getting into a new industry. This would be accomplished by each of the holders assigning his rights to the other. The holding of an improvement patent can also be used for harassment purposes by preventing the underlying patent holder from making and using those improvements himself and restricting the basic patent's usefulness and value.

It is possible to use infringement lawsuits for the sole purpose of harassment. If a desirable patent were held by a financially weak competitor, an infringement suit could upset his precarious financial position. Such an attack would be unethical but difficult to prove since it is not considered illegal to doubt a patent's validity.

The decision to file or not file a patent application in each case is an economic one. Some of the costs to be considered are:

1. The cost of maintaining an "in-house" patent office or retainer fees for an outside attorney.

2. Costs for services required (review committees, presentations, draftsman, secretaries, reproduction, etc.) in preparing the patent.

3. Cost of searches per Professor Kube's lecture of May 4, 1964.

    (1) Novelty Search -- $200
    (2) Patentability Search -- $1000
    (3) Infringement Search -- $2500
    (4) Validity Search -- $5000

4. Government fees.

5. The cost of any interference cases.

6. The cost of valuable time that technical people spend in selling their ideas to top management and going through the procedure of patenting.

Types of Inventions for which Patenting is not Justified

There are certain types of inventions for which patenting gives very little protection in

TO PATENT?

Richard C. Szymanski, Lt., Jr. Grade, USN, is the Space Project Officer Representative at the Applied Physics Laboratory at Johns Hopkins University and is working at the Bureau of Naval Weapons in Silver Spring. He received a B.A. in Physics at the University of Connecticut in 1962. He is now in the Masters of Engineering Administration program here at George Washington University.

maintaining the rights of the inventor. Such an invention would be one of short commercial life. Examples of inventions in this category are novelties, toys, scientific equipment in a rapidly advancing field, and clothing fashions. Since on the average two to three years elapse before an applied-for patent is issued, many of these inventions are not protected during their useful life (a pending patent is not afforded protection by the patent laws). Even if it were possible to patent an invention of short-lived utility, it might not be profitable to prosecute the infringers since the injunction against a violator might be granted after the damage has been done. In such cases, unless the infringer is found guilty of fraud or attempting to maliciously damage the patentee, the patent owner may only receive "a reasonable royalty" which may not be enough to cover his legal fees. A risk which a patent holder takes when filing suit for infringement is that of a counter-claim for damages of injuries suffered by the defendant and a test of the validity of his patent.

Another type of invention for which patenting might not prove justifiable or wise would be one which was related to a company's own shop machines. It is important to remember here that the prime purpose of a patent is to prevent others from using the invention. When the abstract of the invention is published in the Patent Office's Official Gazette, the company's competitors are notified of the existence of the patent and can order a copy of it from the Patent Office. It is now possible for competitors to manufacture and use inventions in their own shop hoping the first company will never detect it. In such cases unless the invention leaves a distinctive mark on the finished product, detection would be difficult if not impossible. In this case, the patent served nothing more than as an educational document for its competitors.

Unique equipment would also fall into the category of inventions not economically worthy of patent. Into this category, for example, fall the "once-only" equipment associated with a one-hundred inch reflecting telescope or experimental hardware for an industry-built satellite. Since there is a good possibility that no one else would want to duplicate the invention, a patent would be useless.

The final example of a type of invention which would not be desirable to patent would be the one which might easily be kept a trade secret. In some cases, to exploit an invention under the wraps of secrecy may prove to be more profitable than the use of a patent. The exploitation of secret inventions has in the past been chiefly related to chemical process and the products made from them. Secret recipes would also fall into this category, one of the most famous being that of "Coca Cola."

Trade Secrets in Lieu of Patents

Whether or not a trade secret can be used as an alternative to patenting in today's technology will depend on the circumstances of each situation. The following is a list of determinations which will have to be made before such a decision can be made.

1. Is the invention patentable?

The standards for patentability have been rising higher during the past several decades and they are expected to continue to rise in the future. It should be noted that it is necessary for an invention to meet all the criteria which are given in section II before it could be considered patentable.

If an individual should "invent" a new recipe for cherry pie, it would not be considered patentable under the statutory class, Composition of Matter, in that the ingredients play their usual role. Novelty and dignity of invention would be lacking. The only recourse available to the inventor would be to practice his invention as a trade secret.

2. Would the invention be protected by a patent?

In cases where a process is to be patented, it may be difficult, if not virtually impossible, to detect infringements. In such cases, it might be wiser to treat the invention as a trade secret rather than patent it.

Another instance in which a patent might be difficult to protect would be the case of the "weak" patent. A weak patent is one which would not hold up under a validity test or could easily be circumvented by competitors. In such a situation, secrecy might afford the protection that a patent would not.

In a rapidly advancing technological field, an invention might be obsolete by the time a patent were issued. A trade secret would be more advantageous in that it would be far more economical and offer a smaller opportunity for compromise.

3. Can the inventor afford the costs of prosecuting the invention?

If the inventor were unable to bear the cost of patenting, it is possible to either use the invention in secret or offer its use to another in return for the patenting fee and royalties.

4. Is the invention one that can be maintained as a secret?

If the invention can be marketed or used secretly in complete safety, it offers the advantage of not growing old or having improvements to it patented by competitors.

5. Would the advantages of using an invention as a trade secret outweigh the risk of not having it patented?

In the situation where the holder of the invention is a leader in an industry, a patent would

--Continued on page 21

A NEW ENGINEERING LIBRARY

by Steve MacIntyre

There was a problem and as usual, engineers were called in to solve it. This time the problem involved the engineers themselves; they needed free and convenient access to books on engineering subjects. Also, their old periodical library was far from adequate as can be seen from the picture on this page. The main library, located two blocks from the engineering school, not only was at an inconvenient distance from the school but employed a book loaning method inadequate for the needs of the engineering students.

The main library requirements for loaning books stipulated that students were not allowed access to the book stacks. The student was to locate the books wanted, by catalogue (call) number, whereupon a librarian assistant would find and bring the books to the student for inspection. After having gone through the tedious and time wasting procedure, the desired book (i.e. the book which best covered the subject matter) might finally be found.

To solve the above stated problem Dean Mason in conference with the members of the faculty decided to move the engineering books from the main library to a new engineering library located in Tompkins Hall (Engineering Building). To effect the move, a committee was formed in the Fall of 1963 with Dr. de Pian as its head.

With this decision, new problems were created. What books should be transferred? How should they be transferred? When they arrived where should they be placed? What kind of shelving should there be to store them in? How should the library be supervised?

The first of these questions had boundary problems. The engineering school had claim only to those books purchased with the funds allocated to it. Since the school had started purchasing books ten years prior, these books had to be found and tagged. This was a long and involved process with care having to be taken that no books purchased by other departments were included in the books to be transferred. This phase of the operation was completed by the end of August 1964 through the hard work of student assistances of the School of Engineering.

The second problem was solved by having the Business Office of the University supply the Engineering School with a truck and some laborers to de-shelve and transport the books from the main library to the engineering library.

The question of where to put the books when they arrived, was a bit of a problem. It was finally decided by the library committee to place them in the old fluid mechanics laboratory in the Mezzanine. This room was no longer being used; it was of adequate size, and it was easily accessible to the students. Therefore it appeared to be an ideal spot for the future library.

Steve Macintyre is a Canadian student here working for a B.S. (Electronics) degree. He is presently working for the School of Engineering and Applied Science, with the engineering library as his primary project. Steve is a member of THETA TAU fraternity and is also active in ice hockey.

To make the interior of the room more agreeable, the walls and ceiling were painted pastel colors and the floor was tiled a bright green. This phase of the operation was completed by the end of August 1964 also.

The fourth question, like the first, had boundary problems -- the library budget! The shelving had to be sturdy, eye pleasing, easily installed, and inexpensive. Only one type of shelving fit all these requirements -- industrial metal shelving. So far as sturdiness was concerned, each shelf could hold 700 pounds worth of books. As for appearance, a picture of the shelves can be seen on this page, so judge for yourselves. The expense -- one-third that of regular library shelves. The shelves were erected by the kind and generous students of the School of Engineering without pay.

The final question -- how to supervise the library -- has not been totally answered. The main trend of thought is to have student assistants, while working on other projects, remain in library to watch that no books are taken out. A librarian has been hired to catalogue and arrange the books. The library hours are tentatively to be from 9:00 a.m. to 9:00 p.m. The opening date -- Any Day Now!

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FEATURES

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ARTICLES

DO YOU HAVE ANYTHING TO SAY? BRING IT TO US.

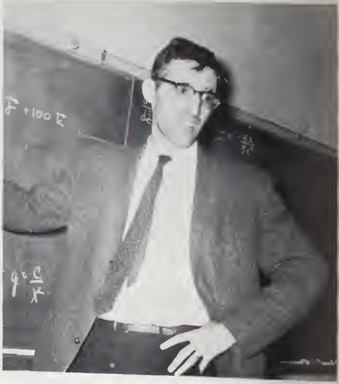
GRADUATE STUDENTS -- *This is your magazine, too. Your term-papers may make good articles. Leave a copy of any paper you want published, along with your telephone number, in our box at the D-H House or in room 206 Tompkins Hall.*

FACULTY NEWCOMERS

Meet a fellow commuter from Arlington, Virginia. He is an Assistant Professor of Engineering and Applied Science. He teaches ApS 59 - Introductory Analytical Mechanics, ApS 63 - Fluid Mechanics, and ApS 68 - Deformable Body Mechanics.

Mr. Hyman was born in New York City. His B.A.E. (Aeronautical Engineering) was obtained at Rensselaer in 1958. In 1961 he earned his M.S. at St. Louis University. He is currently working on a PhD from V.P.I. and has only to defend his thesis before receiving his degree. His activities in college include Sigma Zi, an honorary, and membership in the American Institute of Aeronautics and Astronautics.

Since college he has worked in stress analysis at McDonnell Aircraft Corporation and in structural research at the David Taylor Model Basin. He has taught part-time at St. Louis University. Mecheleciv welcomes Mr. Hyman to George Washington.



BARRY I. HYMAN

NICHOLAS KYRIAKOPOULUS

If this Instructor in Engineering looks familiar to some upperclassmen, it could be because he was a classmate. Mr. Kyriakopoulus graduated from the undergraduate school here at George Washington in 1960 with a major in electrical engineering. He received his Master's at G. W. in 1963. Before returning this year as an Instructor, he worked for NASA.

Mr. Kyriakopoulus teaches Engr 105 - Electrical Engin. lab, ApS 5 - Finite Math and Statistics, ApS 10 - General Field Theory, and ApS 267 - Network Analysis and Syntheses. Mecheleciv welcomes Mr. Kyriakopoulus back and wishes him a happy 27th birthday this November.

ENGINEERS AS MANAGERS?

by Hugo R. Lopez

The number of engineers filling administrative positions in government and industry is increasing every year. In the field of research and development, engineers and scientists occupy over 80% of all the administrative positions. Every year, according to surveys, more and more technical personnel set their sights early on administrative or management careers.

The Professional Engineers Conference Board for Industry surveyed 295 engineers. This is how they responded to two questions:

Question: Suppose an engineer at your company were considering whether to stay strictly in engineering or to move into management end of the business. Assuming proper qualifications for either field, do you think in five years he would be better off financially by staying in engineering or by going into management?

Engineering better	7%
Management better	85%
Same either way	6%
No opinion	2%

Question: In terms of prestige within the company, do you think this same individual would be better off in five years by staying in engineering or by going into management?

Engineering better	6%
Management better	85%
Same either way	7%
No opinion	2%

Why management looks good to engineers? First, a managerial position gives the engineer a sense of power which enhances self-esteem. Second, many engineers feel that the levels of authority and responsibility in the administrative areas are better defined, while in engineering they frequently are given responsibility without corresponding authority, and last, engineers feel that ability and performance in management positions are valued and rewarded better than outstanding skill in technical areas.

The exodus to the management ranks continues. Outstanding technical skill, is generally rewarded with an administrative position, irrespective of the presence or absence of requisite administrative skills.

If this practice continues, several serious repercussions follow:

1. There will be further serious depletion of valuable technical manpower.

Hugo Lopez received a B.S.M.E. degree in 1954 from the University of Houston. He is presently the M.E.A. program here at GW. This article is taken from a term paper he wrote for the course E.A. 255.

2. Effectiveness and utilization of engineers will be seriously reduced. An engineer can not seriously concentrate on his technical work while his eye is focused on the management side of the fence.

3. If the engineer is promoted into administration as a reward for high technical achievement or competence, but lacks managerial potential, the organization will lose an outstanding technical man, while gaining a poor manager. Poor handling of subordinates will take a toll of human talent and hence, also reduces the company's chance of success.

A great number of engineers in supervisory and management work, if they would admit it, would consider themselves engaged in work for which they are ill-suited, in which they have little or no interest, from which they derive only meager satisfaction, and which prevents them from utilizing their real talents and aptitudes fully.

At first, a higher material well-being seemed to them to compensate for the sacrifice they made. Later, the extra money is taken more and more for granted and affords small comfort for the boredom and lack of personal technical challenge in their work. When an engineer's or scientist's self-image of the job roles do not match, dissatisfaction is apt to result.

Of course, there are other engineers and scientists whose choice of management work would be well-taken and whose talents in the administrative line would reap benefits for themselves and their organization.

The Problem

The problem is to: Obtain outstanding technical personnel, to develop them technically, and keep them happy doing technical work.

The outstanding technical man must be discouraged at all costs from a managerial position, especially in the early stages of his technical development, to keep the company's technical potential at its optimum. To accomplish this, all the usual things that dissatisfy the engineer or scientist should be removed or minimized. The following are some of the most common causes of dissatisfaction:

(1) Poor supervision
(2) Low recognition of professional personnel
(3) Lack of challenge in his job
(4) Lack of technical freedom
(5) Lack of opportunity for advancement
(6) Low pay (small and few pay increases)
(7) Too much sub-professional work

—Continued on page 21

CONVERSION FACTORS

MULTIPLY	BY	TO OBTAIN
Abamperes	10	amperes.
Abamperes	3×10^{10}	statamperes.
abamperes per sq. cm.	64.52	amperes per sq. inch.
abampere-turns	10	ampere-turns
abampere-turns	12.57	gilberts
abampere-turns per cm.	25.40	ampere-turns per inch
abcoulombs	10	coulombs.
abcoulombs	3×10^{10}	statcoulombs
abcoulombs per sq. cm.	64.52	coulombs per sq. inch.
abfarads	10^{9}	farads
abfarads	10^{15}	microfarads.
abfarads	9×10^{20}	statfarads.
abhenries	10^{-9}	henries
abhenries	10^{-6}	milihenries.
abhenries	$1/9\times10^{-20}$	stathenries.
abmhos per cm. cube	1.662×10^{2}	mhos per mil foot.
abmhos per cm. cube	10^{3}	megmhos per cm. cube.
abohms	10^{-15}	megohms
abohms	10^{-3}	microhoms.
abohms	10^{-9}	ohms.
abohms	$1/9\times10^{-20}$	statohms.
abohms per cm. cube	10^{-3}	microhms per cm. cube.
abohms per cm. cube	6.015×10^{-3}	ohms per mil foot.
ebvoits	$1/3\times10^{-10}$	statvolts.
abvolts	10^{-8}	volts.
acres	43,560	square feet.
acres	4047	square meters.
acres	1.562×10^{-3}	square miles.
acres	5645.38	square varas.
acres	4840	square yards.
acre-feet	43,560	cubic-feet.
acre-feet	3.259×10^{5}	gallons.
amperes	1/10	abamperes.
amperes	3×10^{9}	statamperes.
amperes per sq. cm.	6.452	amperes per sq. inch.
amperes per sq. inch	0.01550	ebamperes per sq. cm.
amperes per sq. inch	0.1550	amperes per sq. cm.
amperes per sq. inch	4.650×10^{8}	statamperes per sq. cm.
ampere-turns	1/10	ebampere-turns
ampere-turns	1.257	gilberts.
ampere-turns per cm.	2.540	ampere-turns per in.
ampere-turns per inch	0.03937	abampere-turns per cm.
ampere-turns per inch	0.3937	ampere-turns per cm.
ampere-turns per inch	0.4950	gilberts per cm.
areas	0.02471	acres.
areas	100	square meters.
atmospheres	76.0	cms. of mercury.
atmospheres	29.92	inches of mercury.
atmospheres	33.90	feet of water.
atmospheres	10.333	kgs. per sq. meter.
atmospheres	14.70	pounds per sq. inch.
atmospberes	1.058	tons per sq. foot.
Bars	9.870×10^{-7}	atmospheres.
Bars	1	dynes per sq. cm.
Bars	0.01020	kgs. per sq. meter.
Bars	2.089×10^{-3}	pounds per sq. foot
Bars	1.450×10^{-5}	pounds per sq. inch.
board-feet	144 sq. in.x1 in.	cubic inches.
British thermal units	0.2530	kilogram-calories.
Britisb tbermai units	777.5	foot-pounds.
British tbermal units	3.927×10^{-4}	horse-power-hours.
British thermal units	1054	joules.
British thermal units	107.5	kilogram-meters.
Britisb thermal units	2.928×10^{-4}	kilowatt-hours.
B.t.u. per min.	12.96	foot-pounds per sec.
B.t.u. per min.	0.02356	horse-power.
B.t.u. per min.	0.01757	kilowatts.
B.t.u. per min.	17.57	watts.
B.t.u. per sq. ft. per min.	0.1220	watts per square inch.
bushels	1.244	cubic feet.
bushels	2150	cubic inches.
bushels	0.03524	cubic meters.
busbels	4	pecks.
bushels	64	pints (dry).
bushels	32	quarts (dry)
Centares	1	square meters.
centigrams	0.01	grams.
centilters	0.01	liters.
centimeters	0.3937	inches.
centimeters	0.01	meters.
centimeters	393.7	mils.
centimeters	10	millimeters.
centimeter-dynes	1.020×10^{-3}	centimerer-grams.
centimeter-dynes	1.020×10^{-8}	meter-kilograms.
centimeter-dynes	7.376×10^{-8}	pound-feet.
centimeter-grams	980.7	centimeter-dynes.
centimeter-grams	10^{-5}	meter-kilograms.
centimeter-grams	7.233×10^{-5}	pound-feet.

MULTIPLY	BY	TO OBTAIN
centimeters of mercury	0.01316	atmospheres.
centimeters of mercury	0.4461	feet of water.
centimeters of mercury	136.0	kgs. per square meter.
centimeters of mercury	27.85	pounds per sq. foot.
centimeters of mercury	0.1934	pounds per sq. inch.
centimeters per second	1.969	feet per minute.
centimeters per second	0.03281	feet per second.
centimeters per second	0.036	kilometers per hour.
centimeters per second	0.6	meters per minute.
centimeters per second	0.02237	miles per hour.
centimeters per second	3.728×10^{-4}	miles per minute.
cms. per sec. per sec.	0.03281	feet per sec. per sec.
cms. per sec. per sec.	0.036	kms. per hour per sec.
cms. per sec. per sec.	0.02237	miles per hour per sec.
circular mils	5.067×10^{-6}	square centimeters.
circular mils	7.854×10^{-7}	square inches.
circuiar mils	0.7854	square mils.
cord-feet	4 ft.x4 ft.x1 ft.	cubic feet.
cords	8 ft.x4 ft.x4 ft.	cubic feet.
coulombs	1/10	abcoulombs.
coulombs	3×10^{9}	statcoulombs.
coulombs per sq. inch	0.01550	abcoulombs per sq. cm.
coulombs per sq. inch	0.1550	coulombs per sq. cm.
coulombs per sq. inch	4.650×10^{8}	statcouls per sq. cm.
cubic centimeters	3.531×10^{-5}	cubic feet.
cubic centimeters	6.102×10^{-2}	cubic inches.
cubic centimeters	10^{-6}	cubic meters.
cubic centimeters	1.308×10^{-6}	cubic yards.
cubic centimeters	2.642×10^{-4}	gallons.
cubic centimeters	10^{-3}	liters.
cubic centimeters	2.113×10^{-3}	pints (liq.)
cubic centimeters	1.057×10^{-3}	quarts (liq.)
oubic feet	2.832×10^{4}	cubic cms.
cubic feet	1728	cubic inches.
cubic feet	0.02832	cubic meters.
cubic feet	0.03704	cubic yards.
cubic feet	7.481	gallons.
cubic feet	28.32	liters.
cubic feet	59.84	pints (liq.)
cubic feet	29.92	quarts (liq.)
cubic feet per minute	472.0	cubic cms. per sec.
cubic feet per minute	0.1247	gallons per sec.
cubic feet per minute	0.4720	liters per second.
cubic feet per minute	62.4	lbs. of water per min.
cubic inches	16.39	cubic centimeters.
cubic inches	5.787×10^{-4}	cubic feet
cubic inches	1.639×10^{-5}	cubic meters.
cubic inches	2.143×10^{-5}	cubic yards.
cubic inches	4.329×10^{-3}	gallons.
cubic inches	1.639×10^{-2}	liters.
cubic inches	0.03463	pints (liq.)
cubic inches	0.01732	quarts (liq.)
cubic meters	10^{6}	cubic centimeters
cubic meters	35.31	cubic feet.
cubic meters	61.023	cubic inches.
cubic meters	1.308	cubic yards.
cubic meters	264.2	gallons.
cubic meters	10^{3}	liters.
cubic meters	2113	pints (liq.)
cubic meters	1057	quarts (liq.)
cubic yards	7.646×10^{5}	cubic centimeters
cubic yards	27	cubie feet.
cubic yards	46.656	cubic inches.
cubic yards	0.7646	cubic meters.
cubic yards	202.0	gallons.
cubic yards	764.6	liters.
cubic yards	1616	pints (liq.)
cubic yards	807.9	quarts (liq.)
cubic yards per minute	0.45	cubic feet per second.
cubie yards per minute	3.367	gallons per second.
cubic yards per minute	12.74	liters per second.
Days	24	hours.
Days	1440	minutes.
Days	86,400	seconds.
decigrams	0.1	grams.
deciliters	0.1	liters.
decimeters	0.1	meters.
degrees (angle)	60	minutes.
degrees (angle)	0.01745	radians.
degrees (angle)	3600	seconds.
degrees per second	0.01745	radians per second.
degrees per second	0.1667	revolutions per min.
degrees per second	0.002778	revolutions per sec.
dekagrams	10	grams.
dekeliters	10	liters.
dekameters	10	meters.
doliars (U.S.)	5.182	francs (French).
dollars (U.S.)	4.20	marks (German)
dollare (U.S.)	0.2055	pounds sterling (Brit.)
dollars (U.S.)	4.11	shillings (British)
drams	1.772	grams.
drams	0.0625	ounces.
dynes	1.020×10^{-3}	grams.
dynes	7.233×10^{-5}	pounds.

FOR YOUR NOTEBOOK

MULTIPLY	BY	TO OBTAIN
pounds per mil foot	2.306×10^{6}	grams per cubic cm.
pounds per square foot	0.01602	feet of water.
pounds per square foot	4.882	kgs. per square meter.
pounds per square foot	6.944×10^{-3}	pounds per sq. inch.
pounds per square inch	0.06804	atmospheres.
pounds per square inch	2.307	feet of water.
pounds per square inch	2.036	inches of mercury.
pounds per square inch	703.1	kgs. per square meter.
pounds per square inch	144	pounds per sq. foot.
Quadrants (angle)	90	degrees.
Quadrants (angle)	5400	minutes.
Quadrants (angle)	1.571	radians.
quarts (dry)	67.20	cubic inches.
qusrts (llq.)	57.75	cubic inches.
quintals	100	pounds.
quires	25	sheets.
Radians	57.30	degrees.
Radians	3438	minutes.
Radians	0.637	quadrants.
radians per second	57.30	degrees per second.
radians per second	0.1592	revolutions per second.
radians per second	9.549	revolutions per min.
radians per sec. per sec.	573.0	revs. per min. per min.
radians per sec. per sec.	9.549	revs. per min. per sec.
radians per sec. per sec.	0.1592	revs. per sec. per sec.
reams	500	sheets.
revolutions	360	degrees.
revolutions	4	quadrants.
revolutions	6.283	radians.
revolutions per minute	6	degrees per second.
revolutions per minute	0.1047	radians per second.
revolutions per minute	0.01667	revolutions per sec.
revs. per min. per min	1.745×10^{-3}	rads. per sec. per sec.
revs. per min. per min	0.01667	revs. per sec. per sec.
revs. per min. per min	2.778×10^{-4}	revs. per min. per sec.
revolutions per second	360	degrees per second.
revolutions per second	6.283	radians per second.
revolutions per second	60	revs. per min.
revs. per sec. per sec	6.283	rads. per sec. per sec.
revs. per sec. per sec	3600	revs. per min. per min.
revs. per sec. per sec	60	revs. per min. per sec.
rods	16.5	feet.
Seconds (angle)	4.848×10^{-6}	radians.
spheres (solid angle)	12.57	steradians.
spherical right angles	0.25	hemispheres.
spherical right angles	0.125	spheres.
spherical right angles	1.571	steradians.
square centimeters	1.973×10^{5}	circular mils.
square centimeters	1.076×10^{-3}	square feet.
square centimeters	0.1550	square inches.
square centimeters	10^{-4}	square meters.
square centimeters	100	square millimeters.
sq. cms.-cms. sqd	0.02402	sq. inches-inches sqd.
square feet	2.296×10^{-5}	acres.
square feet	929.0	square centimeters.
square feet	144	square inches.
square feet	0.09290	square meters.
square feet	3.587×10^{-8}	square miles.
square feet	.1296	square varas.
square feet	1/9	square yards.
sq feet-feet sqd	2.074×10^{4}	sq. inches-inches sqd.
square inches	1.273×10^{6}	circular mils.
square inches	6.452	square centimeters.
square inches	6.944×10^{-3}	square feet.
square inches	10^{6}	square mils.
squsre inches	645.2	square millimeters.
sq inches-inches sqd	41.62	sq. cms.-cms. sqd.
sq inches-inches sqd	4.823×10^{-5}	sq. ft.-feet sqd.
square kilometers	247.1	acres.
square kilometers	10.76×10^{6}	square feet.
square kilometers	10^{6}	square meters.
square kilometers	0.3861	square miles.
square kilometers	1.196×10^{6}	square yards.
square meters	2.471×10^{-4}	acres.
square meters	10.764	square feet.
square meters	3.861×10^{-7}	square miles.
square meters	1.196	square yards.
square mlles	640	acres.
square mlles	27.88×10^{6}	square feet.
square miles	2.590	square kilometers.
square miles	3,613,040.45	square varas.
square miles	3.098×10^{6}	square yards.
square millimeters	1.973×10^{3}	circular mlls.

MULTIPLY	BY	TO OBTAIN
square millimeters	0.01	square centimeters.
square millimeters	1.550×10^{-3}	square inches.
square mils	1.273	circular mils.
square mils	6.452×10^{-6}	square centimeters.
square mils	10^{-6}	square inches.
square varas	.0001771	acres.
square varas	7.716049	square feet.
square varas	.0000002765	square miles.
square varss	.857339	square yards.
square yards	2.066×10^{-4}	acres.
square yards	9	square feet.
square yards	0.8361	square meters.
square yards	3.228×10^{-7}	square miles.
square yards	1.1664	square vsras.
statamperes	$1/3 \times 10^{-10}$	abamperes.
statamperes	$1/3 \times 10^{-9}$	amperes.
statcoulombs	$1/3 \times 10^{-10}$	abcoulombs.
statcoulombs	$1/3 \times 10^{-9}$	coulombs.
statfarads	$1/9 \times 10^{-20}$	abfarads.
statfarads	$1/9 \times 10^{-11}$	fsrads.
statfarads	$1/ \times 10^{-5}$	microfarads.
stathenrles	9×10^{20}	abhenries.
stathenries	9×10^{11}	henries.
stathenries	9×10^{14}	millihenries.
statohms	$9/10^{20}$	abohms.
statohms	9×10^{5}	megohms.
statohms	9×10^{17}	microhms.
statohms	9×10^{11}	ohms.
statvolts	3×10^{10}	abvolts.
statvolts	300	volts.
steradians	0.1592	hemispheres.
steradians	0.07958	spheres.
steradians	0.6366	spherical right angles.
steres	10^{3}	liters.
Temp. (degs. C)+273	1	abs. temp. (degs. C.)
Temp. (degs. C.)+17.8	1.8	temp. (degs. Fahr.).
temp (degs. F.)+460	1	abs. temp. (degs. F.).
temp. (degs. F.)—32	5/9	temp. (degs. Cent.).
tons (longs)	1016	kilograms.
tons (longs)	2240	pounds.
tons (metric)	10^{3}	kilograms.
tons (metric)	2205	pounds.
tons (short)	907.2	kilogrsms.
tons (short)	2000	pounds.
tons (short) per sq. ft	9765	kgs. per square meter.
tons (short) per sq. ft	13.89	pounds per sq. inch.
tons (short) per sq. in	1.406×10^{6}	kgs. per square meter.
tons (short) per sq. in	2000	pounds per sq. inch.
Varas	2.7777	feet.
Varas	33.3333	inches.
Varas	.000526	miles.
Varas	.9259	yards.
volts	10^{8}	abvolts.
volts	1/300	statvolts.
volts per inch	3.937×10^{7}	abvolts per cm.
volts per inch	1.312×10^{-3}	statvolts per cm.
Watts	0.05692	B.t. units per min.
Watts	10^{7}	ergs per second.
Watts	44.26	foot-pounds per min.
Watts	0.7376	foot-pounds per sec.
Watts	1.341×10^{-3}	horse-power.
Watts	0.01434	kg.-calories per min.
Watts	10^{-3}	kilowatts.
watt-hours	3.415	British thermal units.
watt-hours	2655	foot-pounds.
watt-hours	1.341×10^{-3}	horse-power-hours.
watt-hours	0.8605	kilogram-calories.
watt-hours	367.1	kllogram-meters.
watt-hours	10^{-3}	kilowatt-hours.
webers	10^{8}	maxwells.
weeks	168	hours.
weeks	10,080	minutes.
weeks	604,800	seconds.
Yards	91.44	centimeters.
Yards	3	feet.
Yards	36	inches.
Yards	0.9144	meters.
Yards	1.08	varas.
years (common)	365	days.
years (common)	8760	hours.
years (leap)	366	days.
years (leap)	8784	hours.

ASME
MECH MISS

"THE M.E.'s CHOICE"

The ASME Student Chopter proudly presents lovely Miss Sharon Lond.

This beautiful blue-eyed coed wos born just ocross the Potomac in Arlington, Virginia but lived most of her life os a Southern Belle in Richmond, Virginio before coming to the George Woshington University last spring.

Shoron is currently o second semester freshmon in the Lower Columbian College with an interest in English Literature. Her major interests away from the non-ivy covered wolls of G.W. include doncing, reading, and horseback riding.

As the pictures show, this pretty packoge should definitely be added to the list of new equipment for the M.E. lob . . . . or any other lab!

Photos by
J.L.PROCTOR

WHAT'S

PHOTOGHROMIC GLASS

The research laboratories of Corning Glass Works have developed a series of special glass compositions which darken when exposed to light and clear when the light source is removed. Before darkening, the glass is as clear as a window pane. It darkens to a neutral gray, a brown or a purple.

Called photochromic glass, these light-sensitive materials are still a laboratory development; they are not yet in commercial production. These photochromic materials are silicate glasses which contain dispersed submicroscopic crystals of silver halide, which are precipitated in the manufacturing process during the cooling and reheating of the glass.

When precipitated in glass, the submicroscopic crystals darken under exposure to light. This results in the glass changing color. When the light is removed, the color disappears. This darkening and clearing cycle can be repeated indefinitely.

In previous materials, the reversibility quality wore off or the color change took a long time.

The Corning materials were described as "true glass compositions" with the advantages of transparency, corrosion and abrasion resistance, rigidity, impermeability, and hardness and smoothness of surface.

This type of glass might be formed into products such as windows and sunglasses, optical memory and self-erasing display devices, and as "light valves" in many types of new optical systems.

In photochromic glass, the degree of darkness increases with intensity of light — intensity of light reaching glass on left is greater than that on right.

DIGITAL COMPUTER DESIGNED SPECIFICALLY FOR TEACHING

Known as the Digiac 3080, the new educational digital computer is designed to teach the high school, vocational school or college student all aspects of computer programming, problem-solving and maintenance techniques. The computer uses a magnetic drum memory for internal storage with a capacity of either 1024 words or 4096 words. A FORTRAN compiler will be available, especially designed for training.

When used for training purposes, the Digiac 3080 will enable the student to learn computer logic, understand computer circuits and perform basic trouble-shooting. In the final instruction phases of the program, the student will actually perform malfunction analysis problems which will enable him to repair the computer.

CANDELA

The unit of luminous intensity (candlepower) was defined by both the International Committee and Congress as $\frac{1}{60}$ of the luminous intensity of 1 cm^2 of a blackbody at the temperature of freezing platinum. The name selected for this unit for international usage was candela, the Latin word for candle, but in conformity with common usage in this country it was translated as candle and incorporated into law.

As an example of the ambiguity that has grown up, the National Bureau of Standards has been using candle on its domestic calibration reports, but candela in reports to the International Bureau of Weights and Measures and all other laboratories abroad. Furthermore, the Illuminating Engineering Society of this country has been using candela since 1959.

A recent act of Congress changed the name of the unit of luminous intensity from candle to candela. This action should bring usage in this country into conformance with that of the rest of the scientific world.

FORD'S OXYGEN STEELMAKING FURNACE

Designed to produce 240 tons of steel an hour, this is one of two identical oxygen steelmaking

—Continued on page 18

See the Fair in '65

Unisphere® presented by USS United States Steel

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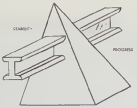

HOW TO TEACH A CLASS

by Norman Seidle

Salesmen are told that everybody without exception has at least a little desire to teach. If this is true, which it probably is, then it stands to reason that those whose everyday life concerns teaching and learning will not only have a desire to teach, but will have some mighty strong convictions as to how a class should be taught. And furthermore, since teaching has several years experience behind it, the best teaching method should have been long established. But here at G.W. rather than one teaching method being singled out, each professor is left to teach his class as he sees fit.

For example, at the September Open Forum Dean Mason criticized the "painless injection" method which is very popular. Have you ever asked Prof. Anand a thought provoking question in class? "That's a good question. Let's all do it for homework; here is a list of references." Dr. Heller gives the benefit of lecturing from the book he thinks has the best presentation. A set of notes from Prof. Braun or Ojalvo is virtually a text book in itself. At the beginning of EE 134, Prof. Meltzer announced that the lectures would be on whatever subject he felt like lecturing that day; whereas his topics for digital lectures are planned well in advance. Prof. dePian wisely teaches principles and methods that are universally adaptable; and as he points out, and the EE's know, this is opposite from the textbook for electronic circuits (Engr. 19-20). A part time professor reads the text to you as if he were reading Mother Goose to his kids. The Dean's Office, thank goodness, permits this vast diversification of teaching methods. Now, I ask you, Why, after all these years of experience and with the wide variety of good, indeed very good, methods mentioned in the few cases above, isn't the best teaching method chosen?

Everyone thinks his method is best; combined with a general desire of students to get different viewpoints and different presentations. What I just said -- and I question its validity -- was that it is my desire, because I am a student, to get different viewpoints in class, and at the same time to get Prof. Anand to answer questions asked in class and Dr. Heller to keep his "elementary math" tidy when he is lecturing from a book I haven't purchased (without losing their many good teaching qualities), bearing in mind that, because they are people, Prof. Anand and Prof. Heller both believe that his teaching method is the best!!! How?

Sunny side up or scrambled. In a couple of weeks (3rd Wed. in November) there will be a panel discussion on teaching methods with Profs. Braun, dePian, and Anand on the panel to present different views. Many other faculty members will be in attendance, and there will be ample time for students to state their views, for other faculty members to state their views, and for everybody to challenge everybody else's views in an honest, responsible atmosphere.

WHAT'S NEW—Cont'd. from page 16

furnaces built by Chicago Bridge & Iron Company for Ford Motor Company, Steel Division, at Dearborn, Michigan. The maximum diameter of each facility is about 24 feet, 10 inches and shell height is about 35 feet, 10 inches.

The oxygen steelmaking method is gaining rapidly in the industry. In the process, high purity oxygen is blown directly into molten iron steel scrap and lime in the furnace, oxidizing impurities and producing refined, quality steel.

COMPUTER TECHNIQUES AID PSYCHOLOGICAL STUDIES

Engineers of the NBS Institute for Applied Technology (U.S. Department of Commerce) have designed a computer-type research apparatus to determine how the monitoring performance of Army personnel is affected by such factors as time on duty, distractions, and the characteristics of displays being monitored. The machine, known as a Vigilometer, was developed at the Institute to simulate a wide range of visual and auditory monitoring tasks, and to measure the effectiveness of monitoring personnel under a variety of conditions.

The importance of vigilance in performing crucial duties has been recognized by armies at all times the world over, as attested to by the traditional death penalty for the sleeping sentry. Vigilance remains a problem, although today's sentry often stands watch over a radarscope or is aided by an electronic alarm system. The difficulty of remaining alert has even been increased by the remote character of the warning and the relatively passive participation of the observer.

--Continued on page 22

CAMPUS NEWS

SIGMA TAU

The second monthly Open Forum discussion session was held. Questions were asked about Graduate Record exams, Mecheleciv, the Library, the D.H. House, . . . when classes should be scheduled. . . , student-faculty relationships, etc.

The 3rd Open Forum will be held in about two weeks — Nov. 18. Professors dePian, Anand, and Braun will present their honest views on how a class should be taught. Both faculty and students will have ample opportunity — in a mature, responsible atmosphere -- to rebutt or reinforce the views stated. Speak now or forever hold your peace; you can't possibly agree with all of the views of all three professors.

THETA TAU

The annual Shrimp Feast, which doubles as a rush party and football practice was held most successfully at Fort Washington. Prospective pledges and brothers wore themselves down in a spirited football game. Immediately after the game, everyone was built up by the arrival of beer, hamburgers, and shrimp. The latter was prepared by the great French chef, Regent Vançois Cribb.

The Theta Tau football team, undoubtedly as a result of the Shrimp Feast buildup, won their first game by a fantastic margin of 13 - zip (0). They were led by the defensive play of John Jenkins and the guiding hand of Coach "One Leg" Jones.

Plans and arrangements are being made for the Banquet and Ball which will be held on November 21. Social Chairman Joe Martino promises good food, music, and if possible a band which doesn't quit at midnight when everyone else is just starting.

This semester's pledge class is now being selected and the results will appear next month.

ENGINEER'S COUNCIL

The Engineer's Council agreed to contribute $250 to the new Engineering School Library. The Council announced that the annual Engineer's Ball will be held on December 12 at the Woodner Hotel. The tickets will be $2.50 per couple with the Council paying part of the cost of the ball. Congratulations to the new members of the Council:

Freshmen Representatives: Rick Blumberg and Berton Goldstein

Intermediate Level Representative: Orville Standifer

IEEE

The student branch of the Institute of Electrical and Electronics Engineers held its first meeting on October 7, 1964. At this meeting Jeffrey B. Goldman was elected Vice-Chairman. The following program was adopted for the Fall semester:

November 4, 1964 - Short Business meeting and a talk on Radio Astronomy by Father Heyden. Time: 8:30 — Place: Tompkins Hall, Room 200

December 2, 1964 - Short Business meeting and a talk on T.V. Broadcasting by a representative from WRC-TV. Time: 8:30 -- Place: Tompkins Hall, Room 200.

December 3, 1964 - Field trip to WRC-TV. Limited to IEEE members only.

Refreshments will be served at all meetings.

The November meeting will be held on the fourth of November at 8:30 p.m. in Room 200 of Tompkins Hall. At this meeting, Father Francis J. Heyden will speak on Radio Astronomy. Father Heyden is presently serving as Professor of Astronomy at Georgetown University Observatory. There will be a short business meeting preceding Father Heyden's presentation. As usual, refreshments will be served following the meeting.

ASME

The monthly meeting of the American Society of Mechanical Engineers will be held on November 4 at 8:30 in Room 306. The tentative schedule for the year will be discussed as well as the student section awards, student paper contest, and possible field trips. Following the business meeting, two movies will be shown.

Any student wishing information about ASME is encouraged to attend the meeting or contact one of the officers.

Chairman, John Bauersfeld; Vice-Chairman Joe Brinkmoeller; Treasurer, Bruce Howard; Secretary, Frank Moy. Refreshments will be served as always.

ASCE

The GWU chapter of ASCE invites you to attend their monthly meeting on Nov. 4 at 8:15 p.m. in TH 102.

Our president has just returned from the ASCE conference in New York and a tour of the World's Fair and will present a report illustrated with photographs taken at the conference and the fair.

The ASCE is an integral part of your professional education. Here is where you find out what the profession is all about and make those first professional contacts that are so important to you when you go out into the business world.

So that you may plan ahead to attend all the meetings, here are the dates of future meetings: December 2; January 6. Refreshments are always served. Plan now to attend the Nov. 4 meeting.

DOES IT PAY TO PATENT—Cont'd. from page 7

have the effect of bringing his competitors up to his level of competence and would give them the opportunity to patent improvements on the basic invention. To practice the invention in secret would force competitors to duplicate the effort the leader has already accomplished and would help keep the leader out in front. Also, funds not spent for patent prosecution could be ploughed back into research to insure leadership.

Conclusion. Although our country's technology is growing by leaps and bounds, the number of patents issued by the Patent Office has changed little in the past five decades.

Period	Patents Issued
1910-1919	397,543
1920-1929	443,742
1930-1939	485,205
1940-1949	348,536
1951-1960	460,831

NOTE: The figures for the years 1910 to 1949 come from the Encyclopedia Americana; those for the years 1951-1960 come from Statistical Abstracts of the United States, 1963.

The apparent lack of utilization of the present system might be attributed to the following:

1. The unreasonable length of time it takes to receive a patent. (2 to 3 years)
2. The high cost of patent prosecution.
3. The rise in the standard of what is patentable.
4. Patent protection is less than desirable.
5. The inventors working for industry are not properly rewarded for their inventions.
6. The use of trade secrets in lieu of patents.

Unless the present trend in patent policies is reversed, more use will be made of trade secrets as an alternative to patenting. It is my opinion that the increased use of this form of invention protection is a direct result of our rapid technological growth and outdated patent system and the use of trade secrets will continue to increase unless the patent system is modified to meet the needs of modern technology.

BIBLIOGRAPHY

Calvert, Robert. Patent, Practice and Management (New York 1949).

Heyel, Carl, ed. Handbook of Industrial Research Management (New York 1963).

Moore, Franklin G. Manufacturing Management (Homewood, Illinois 1958).

Patent Codification Act, 1953.

Woodling, George V. Inventions and Their Protection (New York 1953).

Engineers as Managers—Cont'd. from page 12

(8) Poor technical development programs
(9) Lack of professional atmosphere
(10) Works with lazy or disinterested personnel

To promote an outstanding engineer or scientist above his supervisor is regarded in many organizations as an insurmountable barrier, yet many progressive companies have set up consulting groups made up of such outstanding professionals to keep them in the organization by by-passing the "supervisor road block".

A challenging and excessive work load is better than a challenging, but meager work load, or no challenge in the work whether the load is small or excessive. Proper personnel staffing and work load distribution eliminates this problem.

The use of technicians or aides to reduce the sub-professional work load of the engineers or scientists is good practice.

Professional Development

Technical development is the common duty of supervisors, management and the individual. The supervisor must pass on to the young engineer or scientist the wealth of experience and knowledge he possesses; he must encourage his active participation in technical discussion, reading of technical articles, membership in professional societies, etc.

The management should provide in-house technical conferences and seminars, free tuition for advanced courses and/or degrees in local universities, funds for attendance at technical society seminars, and must provide the individual with a creative environment. Both the supervisor and management should encourage publication of technical achievements in trade magazines and filing of patents whenever a patentable device or system is discovered or developed. Technical recognition should be awarded for outstanding accomplishments or for sustained above-average performance.

The supervisor should assign whenever possible, work that is above their heads in order to develop interests in more advanced technology or in other fields of technical knowledge, and to broaden their background.

All supervisors should keep in mind the statement of George S. Trimble, Jr., Martin Company: "As an engineering supervisor, you are in command of the most precious energy on earth - human thought. Your success is a function of how much of this energy you can bring out of each of your people and how well you direct its use. Sometimes it is difficult to tell how much capacity an individual has for producing this energy and still more difficult to tell just how he is using his output. But it is a safe bet that every individual is capable of doing better than he has ever done before." The individual must have the desire to improve himself, besides the energy, initiative and resourcefulness that will make him outstanding, otherwise he must be removed or retrained for another job.

WHAT'S NEW—Cont'd from pg. 18

The Vigilometer controls stimulus situations and records the responses of up to five subjects at a time. Analysis of the responses will help Army behavioral scientists to relate monitor performance to such factors as environmental constraints, supervisory controls, fatigue, distraction, and the type and pattern of display. The findings will be useful in the field of personnel utilization, particularly in specifying optimum work methods and conditions.

* * * * * * * * * * * * * * * * * *

Full-time undergraduate engineering enrollments have increased this past year, according to a report from the U. S. Office of Education. Doctorates in engineering have increased more than 14 per cent in the past year. The report "Total Engineering Degrees (1962-63) and Enrollments (Fall 1963) in Institutions with One or More ECPD-accredited Curricula" will be published in the February issue of the JOURNAL OF ENGINEERING EDUCATION.

Dr. Harold A. Foecke, Specialist for Engineering Education in the U.S. Office of Education, has completed the compilation of the total engineering degrees granted in 1962-63 and Fall, 1963, enrollments. Although the report concentrates on the data for institutions with one or more curricula accredited by the Engineers' Council for Professional Development (ECPD), the same general picture is revealed by data for all institutions granting engineering degrees.

The report indicates that the gradual decline in engineering Bachelor's degrees may be ending. The number of master's and doctor's degrees in engineering awarded last year increased sharply, while bachelor's degrees declined -- continuing the trends which have existed at these three levels for the past several years. Engineering enrollments at the graduate levels also continued the pattern of significant annual increases, while at the undergraduate level the series of five previous annual declines was ended by a slight rise last fall in enrollments for the bachelor's degree.

During the last eight years, the overall rate of increase of doctor's degrees in engineering has

—Continued next page

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exceeded the corresponding rate of increase for any other major field in higher education. The rate of increase has also far exceeded the overall rate of increase in the total number of earned doctor's degrees awarded in the aggregate United States.

During the academic year 1962-63, 1,378 doctor's degrees in engineering were awarded by institutions with one or more ECPD-accredited curricula -- an increase of 14.2 per cent over the preceding year. These degrees were conferred by 76 institutions -- the same number as last year. The annual output of doctor's degrees in engineering has almost doubled (93 per cent increase) in four years. Enrollments for doctor's degrees in engineering in institutions with one or more ECPD-accredited curricula have more than tripled in seven years -- rising from 3,400 in the fall of 1956 to 10,980 last fall.

The 11 institutions granting the largest numbers of doctor's degrees in 1962-63 were: Massachusetts Institute of Technology, 128; Stanford University, 91; University of Illinois, 81; Purdue University, 81; University of Michigan, 60; University of California (Berkeley), 59; Harvard, 40; Ohio State University, 39; Carnegie Institute of Technology, 36; Cornell University, 35; and Iowa State University, 35.

Master's Degrees

During the academic year 1962-63, the institutions with one or more ECPD-accredited curricula awarded 9,600 master's degrees in engineering -- an increase of 8.2 per cent over the preceding year. These degrees were conferred by 144 institutions -- an increase of 2 over the preceding year. The number of master's degrees in engineering has increased consistently for 10 years, and has more than doubled the last 7 years. The enrollments for master's degrees in institutions with one or more ECPD-accredited curricula have increased for the ninth consecutive year, reaching a new high of 38,172 last fall -- up 9.2 per cent over the fall of 1962. "It is clear," said Dr. Foecke, "that an increasing fraction of those receiving bachelor's degrees are choosing to continue their formal education in engineering."

The 10 institutions granting the largest numbers of master's degrees were: Massachusetts Institute of Technology, 482; New York University, 373; University of Michigan, 354; University of Illinois, 326; Stanford University, 326; University of California (Berkeley), 312; Purdue University, 287; University of Southern California, 270; Rensselaer Polytechnic Institute, 201; and Columbia University, 187.

THE SHAFT

The father, passing through G.W.'s campus late one evening thought he would pay his boy a surprise visit. Arriving at the lad's fraternity house, dad rapped loudly on the door. After several minutes of knocking, a sleepy voice drifted down from a second-floor window, "Waddyah want?"

"Does Ramsey Duncan live here?" asked the father.

"Yeah, replied the voice. Dump him on the front porch."

* * *

People who live in glass houses shouldn't.

* * *

A Georgia engineer was trying to make up time up North. "Honey chile," he purred to a luscious Yankee Coed, "would it be all right if Ah kissed yo' all?"

Snapped she: "Aren't my lips enough?"

* * *

Engineers are continually surprised to find that girls with the most streamlined shapes offer the most resistance.

* * *

Engineer to Date: "How many beers does it take to make you dizzy?"

Date: "Four or five and don't call me Dizzy."

* * *

Overheard at a bridge party: "Take your hands off my trick!"

* * *

Tonto and the Lone Ranger are surrounded by 10,000 fierce Indians. "Well Tonto, it looks like the end of us."

"What do you mean 'us', paleface?"

* * *

Little Billy with a grin,
Drank up all his Daddy's gin.
His Mother said when he got plastered
"Go to bed you little Bad Boy."

* * *

Once a King, always a King,
But once a night is enough.

* * *

Daff. of a WENCH: Something to turn the head of a dolt.

Daff. of a HOME: Where you can scratch any place it itches.

* * *

"He says I don't know how to dress, huh! Well, tonight I'll wear my new low cut dress and show him a thing or two."

* * *

Some refer to Washington, D. C. as the city of protocol, alcohol and Geritol.

* * *

I drove my car with one hand and my girl friend wild with the other.

* * *

"No," said the centipede, crossing her legs, "a hundred times No."

* * *

What's grey on the inside and transparent on the outside? An elephant in a baggie.

* * *

Definition

An Engineer is one who passes as an exacting expert on the strength of being able to turn out with prolific fortitude, strings of incomprehensive formulae calculated with micromatic precision from extremely vague assumptions which are based on debatable figures acquired from inconclusive tests and quite incomplete experiments carried out with instruments of problematic accuracy by persons of doubtful reliability and rather dubious mentality.

* * *

Student in crowded Parking Lot to Attendant:

"That is my car right there-- the third from the top."

* * *

An Engineer taking an Old Testament course was asked the significance of the story of David and Goliath. The Engineer thought a moment and said, "Duck!"

* * *

Co-ed: "Where did you learn to kiss like that?"

M.E.: "Siphoning gas."

The height of bad luck: seasickness and lockjaw.

* * *

He was a rather undersized freshman at his first college dance, but despite his smallness and bashfulness he was sure of himself in his own way. He walked over to a beautiful and over-sophisticated girl and said, "Pardon me, Miss, but may I have this dance?"

She looked down at his small size and lack of fraternity pin and said, "I'm sorry, but I never dance with a child!"

The freshman bowed deeply and said, "Oh, I'm sorry, I didn't know your condition."

* * *

Three eminent doctors were bragging among themselves one day. Said the first, "I grafted an arm on a fellow and now he plays tennis like a pro." Said the second, "I grafted a leg on a man and now he runs on the Olympic team." The third man took the cake with, "I once grafted a smile on a jackass and now he is a Congressman."

* * *

Probably the reason that God made woman last was that he didn't want any advice while creating man.

* * *

We were given two ends to use. One to think with; one to sit with. Success depends on which we use. Heads we win; tails we lose.

* * *

Daff. of a REDHEAD: -- A Communist toilet.

* * *

Now go back and read the rest of this magazine.

Advancement in a Big Company: How it Works

An Interview with General Electric's C. K. Rieger, Vice President and Group Executive, Electric Utility Group

C. K. Rieger

■ Charles K. Rieger joined General Electric's Technical Marketing Program after earning a BSEE at the University of Missouri in 1936. Following sales engineering assignments in motor, defense and home laundry operations, he became manager of the Heating Device and Fan Division in 1947. Other Consumer-industry management positions followed. In 1953 he was elected a vice president, one of the youngest men ever named a Company officer. Mr. Rieger became Vice President, Marketing Services in 1959 and was appointed to his present position in 1961. He is responsible for all the operations of some six divisions composed of 23 product operations oriented primarily toward the Electric Utility market.

Q. How can I be sure of getting the recognition I feel I'm capable of earning in a big company like G.E.?

A. We learned long ago we couldn't afford to let capable people get lost. That was one of the reasons why G.E. was decentralized into more than a hundred autonomous operating departments. These operations develop, engineer, manufacture and market products much as if they were independent companies. Since each department is responsible for its own success, each man's share of authority and responsibility is pinpointed. Believe me, outstanding performance is recognized, and rewarded.

Q. Can you tell me what the "promotional ladder" is at General Electric?

A. We regard each man individually. Whether you join us on a training program or are placed in a specific position opening, you'll first have to prove your ability to handle a job. Once you've done that, you'll be given more responsibility, more difficult projects—work that's important to the success of your organization and your personal development. Your ability will create a "promotional ladder" of your own.

Q. Will my development be confined to whatever department I start in?

A. Not at all! Here's where "big company" scope works to broaden your career outlook. Industry, and General Electric particularly, is constantly changing — adapting to market the fruits of research, reorganizing to maintain proper alignment with our customers, creating new operations to handle large projects. All this represents opportunity beyond the limits of any single department.

Q. Yes, but just how often do these opportunities arise?

A. To give you some idea, 25 percent of G-E's gross sales last year came from products that were unknown only five or ten years ago. These new products range from electric tooth brushes and silicone rubber compounds to atomic reactors and interplanetary space probes. This changing Company needs men with ambition and energy and talent who aren't afraid of a big job—who welcome the challenge of helping to start new businesses like these. Demonstrate your ability—whether to handle complex technical problems or to manage people, and you won't have long to wait for opportunities to fit your needs.

Q. How does General Electric help me prepare myself for advancement opportunity?

A. Programs in Engineering, Manufacturing or Technical Marketing give you valuable on-the-job training. We have Company-conducted courses to improve your professional ability no matter where you begin. Under Tuition Refund or Advanced Degree Programs you can continue your formal education. Throughout your career with General Electric you'll receive frequent appraisals to help your self-development. Your advancement will be largely up to you.

FOR MORE INFORMATION on careers for engineers and scientists at General Electric, write Personalized Career Planning, General Electric, Section 699-11, Schenectady, N. Y. 12305

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